

TOSHIBA

UNINTERRUPTIBLE POWER SUPPLIES



1700 Series

Reliability in motion™

**User Manual
1700 Series
Uninterruptible Power System
Single Phase 1.5/2.0/2.4 kVA**

IMPORTANT NOTICE

The instructions contained in this manual are not intended to cover all of the details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Toshiba sales office.

The contents of this instruction manual shall not become a part of or modify any prior or existing agreement, commitment, or relationship. The sales contract contains the entire obligation of Toshiba International Corporation's UPS Division. The warranty contained in the contract between the parties is the sole warranty of Toshiba International Corporation's UPS Division and any statements contained herein do not create new warranties or modify the existing warranty.

Any electrical or mechanical modifications to this equipment, without prior written consent of Toshiba International Corporation will void all warranties and may void UL/CUL listing. Unauthorized modifications also can result in personal injury, death, or destruction of the equipment.

UNINTERRUPTIBLE POWER SUPPLY

If additional information or technical assistance is required beyond what is included in this manual contact Toshiba's marketing department by calling toll free (800) 231-1412, by e-mail at toshibaups@tic.toshiba.com, or write to: Toshiba International Corporation, 13131 W. Little York Road, Houston, TX 77041-9990.

Please complete the following information for your records and to remain within this equipment manual:

Model Number: _____

Serial Number: _____

Date of Installation: _____

Inspected By: _____

December, 2004
Part no. 50124-002

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GENERAL SAFETY INSTRUCTIONS

Warnings in this manual appear in two different ways:

- 1) *Danger warnings* - The danger warning symbol is an exclamation mark enclosed in a triangle that precedes the large bold letters spelling the word "DANGER". The Danger warning symbol is used to indicate situations, locations, and conditions that exist and can cause serious injury or death:



DANGER

- 2) *Caution warnings* - The caution warning symbol is an exclamation mark enclosed in a triangle that precedes the large bold letters spelling the word "CAUTION". The Caution warning symbol is used to indicate situations and conditions that can cause operator injury and/or equipment damage:



CAUTION

Other warning symbols may appear along with the *Danger* and *Caution* symbol and are used to specify special hazards. These warnings describe particular areas where special care and/or procedures are required in order to prevent serious injury and possible death:

- 1) *Electrical warnings* - The electrical warning symbol is a lightning bolt mark enclosed in a triangle. The electrical warning symbol is used to indicate high voltage locations and conditions that may cause serious injury or death if the proper precautions are not observed.



- 2) *Explosion warnings* - The explosion warning symbol is an explosion mark enclosed in a triangle. The explosion warning symbol is used to indicate locations and conditions where molten, exploding parts may cause serious injury or death if the proper precautions are not observed.



IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS. This manual contains important instructions for the 1.5 and 2.4kVA 1700 Series Toshiba UPS. These instructions should be followed during the installation and maintenance of the UPS and its batteries.

- The maximum ambient temperature in which this UPS unit should be operated or stored is 104 °F (40 °C).
- The batteries for the Toshiba 1700 Series 1.5 and 2.4kVA UPS are housed in a self-contained battery module. This module should not be opened under any circumstances. To replace the batteries, a new module should be obtained from your local Toshiba representative, or contact the Toshiba UPS marketing department toll-free at (800) 231-1412.
- When changing battery packs, be sure to use the proper model unit.



CAUTION

Misuse of this equipment could result in human injury and equipment damage. In no event will Toshiba Corporation be responsible or liable for either indirect or consequential damage or injury that may result from the use of this equipment.



DANGER



Do not dispose of the battery module in a fire. The batteries inside may explode.



CAUTION

Do not open or mutilate the battery module. Released electrolyte is harmful to the eyes and skin, and could be toxic.



CAUTION

This unit contains sealed lead acid batteries. Lack of preventative maintenance could result in batteries exploding and emitting gasses and/or flame.



CAUTION

Failure to replace the battery pack in accordance to the maintenance schedule may cause the batteries inside to crack, possibly releasing electrolytes from the battery, and resulting in secondary faults such as odor, smoke and fire.

INSTRUCTIONS IMPORTANTES CONCERNANT LA SÉCURITÉ

CONSERVER CES INSTRUCTIONS. Cette notice contient des instructions importantes concernant la sécurité.



ATTENTION Une batterie peut présenter un risque de choc électrique, de brûlure par transfert d'énergie.



ATTENTION Pour le remplacement, utiliser le même nombre de batteries du modèle suivant.



ATTENTION L'élimination des batteries est réglementée. Consulter les codes locaux à cet effet.

Inspection/Installation

Inspection of the New UPS Equipment

Upon receipt of the UPS, a careful inspection for shipping damage should be made.

After Unpacking:

- 1) Check the unit for loose, broken, bent or otherwise damaged parts. If damage has occurred during shipment, keep all original packing materials for return to shipping agent. Warranty will not apply to units damaged during shipment.
- 2) Check to see that the rated capacity and the model number specified on the nameplate conform to the order specifications.

Installation Precautions



CAUTION

- 1) Install the unit in a well ventilated location; allow at least 10 cm (4 inches) on all sides for air ventilation and for maintenance.
- 2) Install the unit in a stable, level, and upright position that is free of vibration.
- 3) Install the unit where the ambient temperature is between 32° and 104°F (0° and 40°C).
- 4) Do not install the UPS in areas that are subject to high humidity.
- 5) Do not install the UPS in a location that will cause direct sunlight to shine on the unit.
- 6) Do not install the UPS in areas that are subject to contamination such as high levels of airborne dust, metal particles, or flammable gas.
- 7) Avoid installation near sources of electrical noise. Always make sure that the unit earth ground is intact to prevent electrical shock and to help reduce electrical noise.
- 8) Do not install where water or any foreign object may get inside the UPS.
- 9) This UPS generates and can radiate radio-frequency energy during operation. Although RFI noise filters are installed inside the unit there is no guarantee that the UPS will not influence some sensitive devices which are operating close by. If such interference is experienced, the UPS should be installed farther away from the affected equipment and/or powered from a different source than that of the affected equipment.

Operating Precautions



CAUTION

- 1) The UPS should not be powered up until this entire manual has been reviewed.

- 2) The input power source voltage and frequency must be within the allowable range as specified in appendix A. Voltages and frequencies outside of the permissible tolerance range may cause internal protection devices to activate.
- 3) The UPS should not be used with a load whose rated input is greater than the rated UPS output.
- 4) Do not use the UPS to provide power to motors that require high starting current or that require a long starting time such as vacuum cleaners and machine tools (unless appropriate sizing is done by a Toshiba applications engineer, or other qualified personnel).
- 5) Do not insert metal objects or combustible materials in the unit's ventilation slots.
- 6) Do not place, hang, or paste any objects on the top or on the exterior surfaces of the UPS.

External Layout Electronics Module

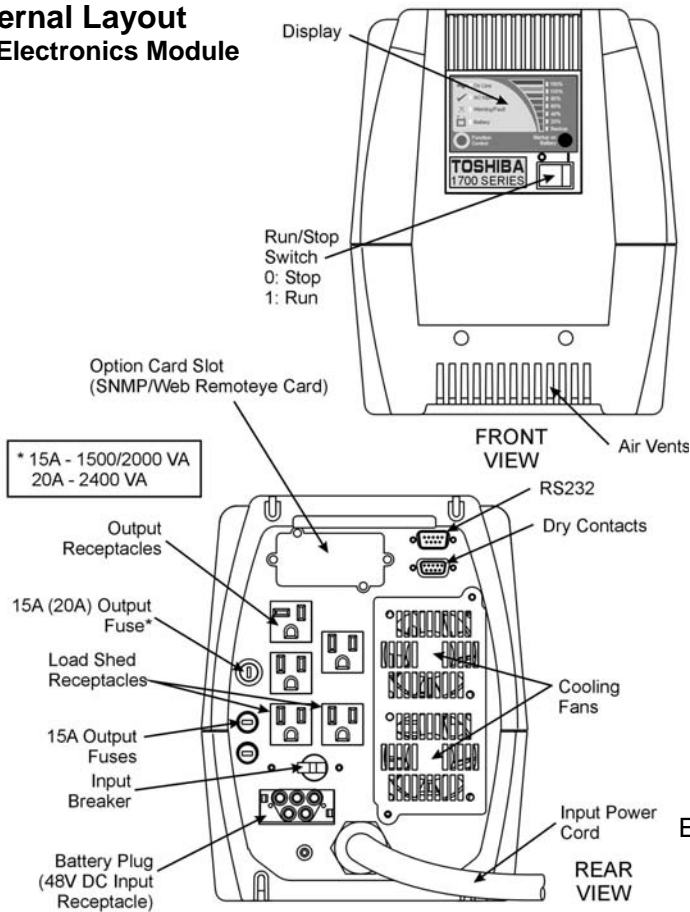


Figure 1
Electronics
Module
Layout

Battery Module

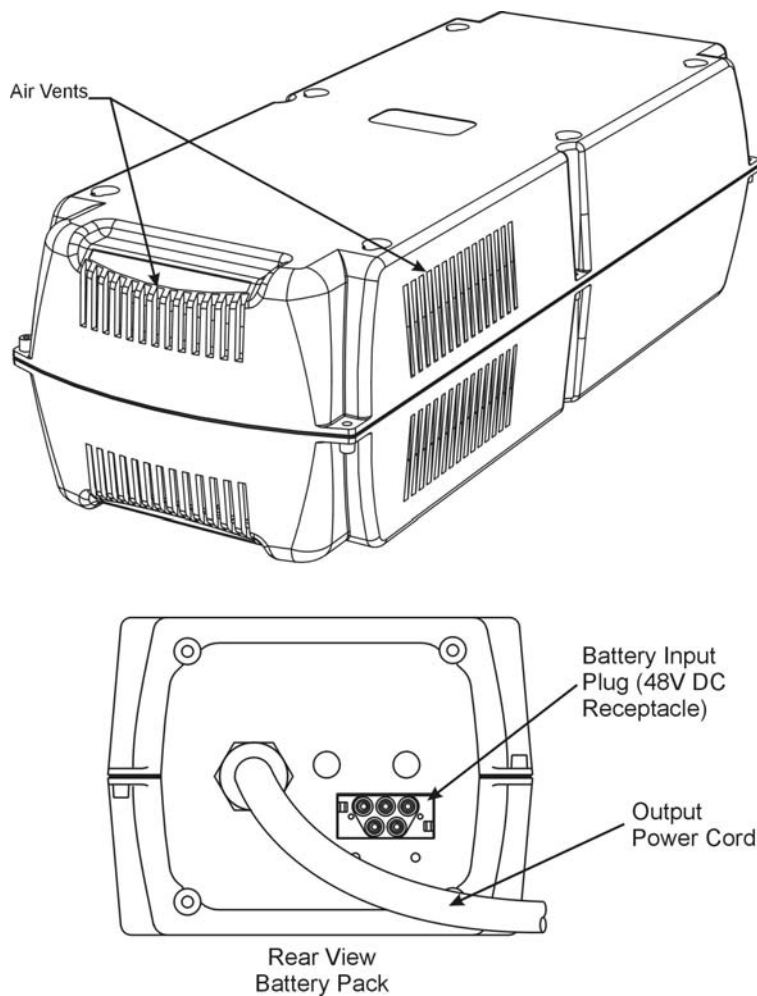


Figure 2
Battery Module Layout

UPS Connections

Standard Module Connections

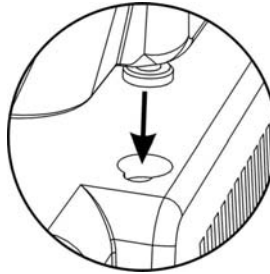
The illustration on the following page shows the proper assembly of the two modules that make up the standard unit. If additional battery modules are being installed with the standard unit see page 20. For all other option modules see page 21.

Note: No more than three modules should be stacked on top of each other for any configuration.

Standard Module Connections (cont'd)

If two modules are to be stacked on top of each other, they should be interlocked to reduce the chances of the top module being knocked over. Modules do not have to be stacked for the system to operate. The following steps will guide the user through the process of assembling and connecting the modules.

Step 1: Place the electronics module on top of the battery module so that the six round feet on the bottom of the electronics module fit into the matching keyhole slots on the top of the battery module.



Step 2: Slide the upper unit forward. This will cause the two units to lock together. In order to unlock the units, lift up on the top module, and slide it back. This will release the interlock (figure 3).

Step 3: Connect the input power cord (figure 4) to the AC power source. If no AC power source is available go to step 5.

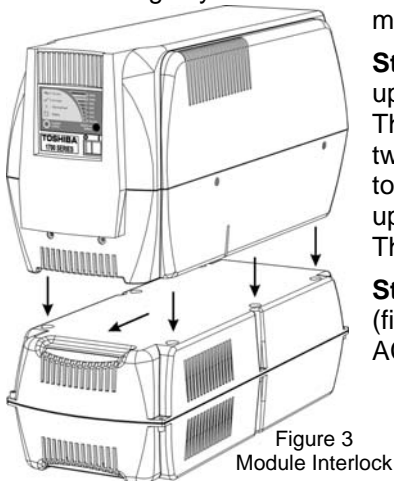


Figure 3
Module Interlock

Step 4: Switch the input breaker to the on position (figure 1, page 9). Please note that a battery fault will occur.

Step 5: Plug the battery cord coming from the battery pack into the blue battery plug located on the back of the electronics module (figure 4). This will clear the fault from step 4. **Attention:** If the battery cord is not plugged into the battery plug the UPS will not be able to provide backup power in the event of a loss of AC input power.

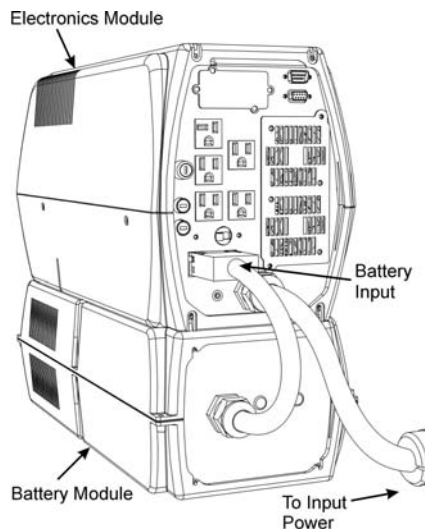


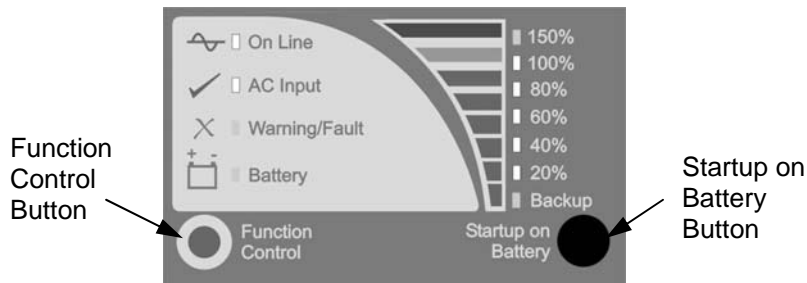
Figure 4
Power Connections



CAUTION Battery modules present a lifting hazard. The battery module for this unit weighs approximately 60 lbs. Two person lift is required to avoid injury.

Operating the UPS

Display Panel Layout



 On Line


ON LINE (green lamp)
Lights **green** when the UPS's inverter is supplying power to the load.

 AC Input

AC INPUT (green lamp)
Lights **green** when normal AC input power is being supplied to the UPS unit.

 Warning/Fault

WARNING/FAULT (red lamp)
Lights **red** when the UPS unit is experiencing an abnormal condition.

 Battery

BATTERY (red lamp)
Lights **red** to indicate that a condition exists that is affecting the batteries.

Starting the UPS System

Once the modules have been connected as shown in the preceding section (UPS Connections, page 10) the UPS system is ready to be started. There are two ways to start the system: from AC input power (if present) or from batteries. If not already done, switch the input breaker on (figure 1, page 9). If the "AC Input" LED is lit, proceed on to "Starting when AC power is available". If the LED is not lit, there is no AC power available. If the unit is to be started when AC power is not available proceed to "Starting on DC power."

Starting When AC Power is Available

If the system is being started with AC input power the system is started by switching the RUN/STOP switch to the RUN position (RUN = I, STOP = 0). When the RUN/STOP switch is in the RUN position both the "AC Input" and the "On Line" LEDs should be lit. When the unit is started with AC input power it is advisable to allow time for the batteries to fully charge before any load is connected (see "Battery Recharge Time", page 16).

Starting on DC Power

If no AC power source is available, or if the AC input power is outside of the allowable range for voltage or frequency, the UPS can be started from battery power. The length of UPS operation time on battery power depends on the number of attached battery modules and the amount of load the UPS is supporting. To start the UPS from battery power follow these steps:

Step 1: Make sure the RUN/STOP switch is in the STOP position. If the UPS is being started on DC power because the AC power is out of range, the input breaker must be in the OFF position (figure 1, page 9).

Step 2: Press the “Startup on Battery” button. The UPS will beep indicating that AC power is not available and the Startup on Battery mode has been activated.

Step 3: Switch the RUN/STOP switch to the RUN position. This must be done within 5 seconds of the Startup on Battery mode activation for the unit to startup using batteries.

Once the unit has started, the “On Line” LED will light, indicating that the inverter is running and power is available at the output receptacles. If the RUN/STOP switch is not switched to the RUN position within those 5 seconds, the unit will return to shutdown mode.

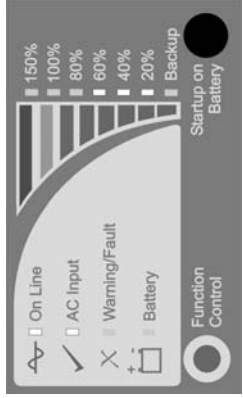
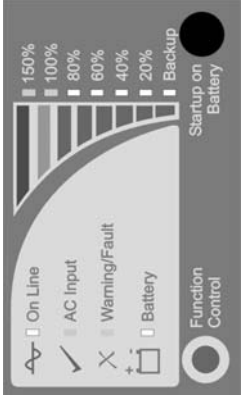
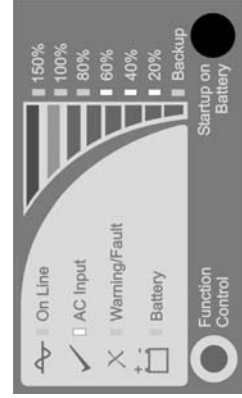
Stopping the UPS

There are two ways of turning the UPS off: switching from on line to bypass mode, or completely shutting down.

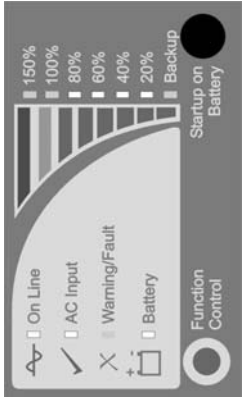
Option 1: The first option is to place the UPS into bypass mode. Bypass mode means that if there is AC power available, the UPS will route power directly from the input source to the connected loads without any conditioning. The UPS inverter is off during this state, but the attached loads do not lose power during the transition. To place the UPS into bypass mode, switch the RUN/STOP switch to the STOP position. This mode is most often used manually during maintenance and programming operations or automatically upon the occurrence of an internal UPS fault. (For more information concerning bypass mode see appendix E.)

Option 2: The other option is to turn the UPS off completely. This means that in addition to the UPS's inverter shutting down, **all power will be stopped to any equipment attached to the UPS.** To shut the UPS down completely switch the RUN/STOP switch to the STOP position. Then switch the input breaker off (figure 1, page 9). Once the input breaker has been switched off, all the LEDs should turn off. (If the RUN/STOP switch is in the RUN position when the input breaker is switched off, the unit will switch to battery backup mode. The unit will continue to run for as long as the available battery reserves can support the connected loads.)

UPS Display Status and Operating Condition

Operation Mode	Display State	LED State	Alarm State	Notes
Normal		On Line..... On AC Input On 20% to 100%* .. On *see note 1.	Alarm is off.	
Battery Backup		On Line..... On Battery On Backup On 20% to 100%* .. On *see note 2.	Alarm will sound for 1 second at 10 second intervals.	The unit will return to normal operation mode when AC power is restored.
Bypass		AC Input On 20% to 100%* .. On *see note 1.	Alarm is off.	Battery backup is not available.

UPS Display Status and Operating Condition

Operation Mode	Display State	LED State	Alarm State	Notes
Parallel Operation		On Line..... On AC Input On Battery On 20% to 100%* .. On *see note 1.	Alarm will sound for 1 second at 10 second intervals.	Parallel operation occurs when input power is present, but inadequate to fully power the connected load. The batteries are used to supplement the AC input power. The UPS will return to normal operation when full input power returns.

All other display conditions constitute either a warning or a fault condition. These conditions are explained in the section titled "Troubleshooting" (page 22) in the charts on Warnings and Faults.

Note 1: The level meter, which consists of the LEDs labeled 20% through 150%, will light according to the current amount of load connected. As the load exceeds one level, the next level will begin to blink, increasing the blink rate as the load increases until that full percentage is reached. For example, if the unit is loaded to 40% of maximum output power the 20% and 40% LEDs will be lit. If another small load is added increasing the load to 45% the 60% LED will begin to blink. If a little bit more load is added so that the total load becomes 50% the 60% LED will blink faster. This will continue until enough load is added to equal 60% of the maximum output power at which time the 60% LED will stop blinking and light continuously.

Note 2: The level meter described in note 1 above also displays the remaining battery time when the unit is in backup mode. If the batteries are fully charged when the unit switches to backup mode the 20% through 100% LEDs will light. As the batteries begin to discharge, the LEDs starting from the top will blink rapidly then slowly and will then turn off as the battery time runs down. For example if the unit has been running on battery power and there is 90% battery capacity remaining the 20% through 80% LEDs will be lit and the 100% LED will be blinking.

Battery Backup Time

The exact amount of backup time provided will vary depending on the UPS model being used, number of batteries, condition of the batteries and other factors. However, the chart below gives the times that can be expected from the standard units with batteries in good condition. For greater backup time, an additional battery module may be added to the standard unit. Only one additional battery module may be added to the standard unit. For longer runtime options contact your Toshiba sales representative or the Toshiba marketing department at (800) 231-1412 or by e-mail at toshibaups@tic.toshiba.com.

Table 1
Backup Time*

UPS Model	With 1 Battery Module Full Load / Half Load	With 2 Battery Modules Full Load / Half Load
1500 VA	17 min / 45 min	45 min / 116 min
2000 VA	13 min / 32 min	32 min / 77 min
2400 VA	9 min / 26 min	30 min / 64 min

* Times given are approximate and will vary depending on the age of the batteries, the battery temperature, the number of previous discharges and the type of load.

Load Shed Function

The 1700 Series includes a load shed function. During battery backup operation, this function allows the load connected to two of the receptacles (figure 1, page 9) to be turned off in an effort to conserve power for more critical loads. The battery level at which these two receptacles will be turned off, or “shed”, can be set by the user (see “The Function Control Button”, page 17). By default, this feature is configured so that these two receptacles will remain on for the full battery backup time available (no “shedding”)

Battery Recharge Time

The following table gives estimates on time required to recharge the UPS's batteries. The recharge time may vary depending on the battery temperature, the age of the batteries, and other factors.

Table 2
Battery Recharge Time*

Unit	With 1 Battery Module	With 2 Battery Modules
1500 VA	4 ½ hours	9 hours
2000 VA	4 ½ hours	9 hours
2400 VA	4 ½ hours	9 hours

* Recharge times are to 90% full capacity.

Fan Speed

The 1700 Series UPS has variable speed fans. The fan speed will vary depending on a number of factors. As the load placed on the UPS increases the fan speed will increase. The temperature of the environment the UPS is operating in can also cause the fan speed to increase. (For a more detailed explanation of the variable speed fan function refer to appendix B)

Battery Check Function

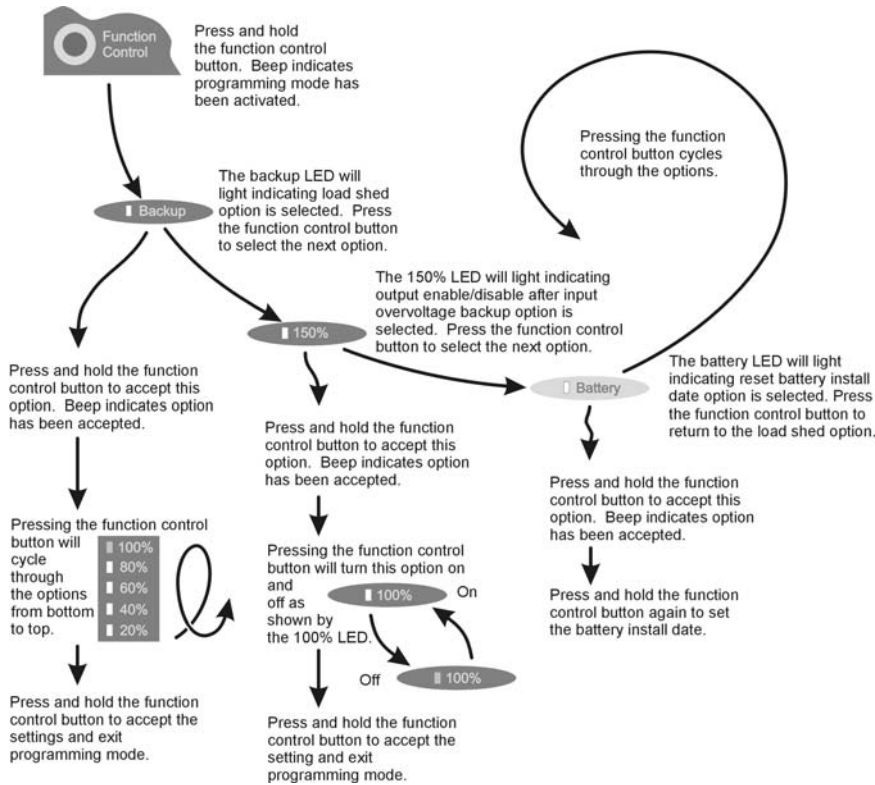
During startup the UPS will perform an automatic 'Battery Check' to detect whether a problem exists in the battery circuit. If the batteries pass the test, the unit will start normal operation. If a problem is detected during the test the "Warning/Fault" LED will activate. Other LED's may also activate. If this occurs please refer to the "Troubleshooting" section on page 22 for a description of the problem and possible solutions. **It is important to note that when the UPS has detected bad batteries, the battery backup mode is disabled.** The unit will continue to operate and provide clean power; however, since there is no battery power available, the unit cannot provide backup power if input power is lost.

The Function Control Button

The function control button is located on the display panel (see "Display Panel Layout", page 12). This button is used to perform several different UPS operations, including initiating a self test, providing programming options, and silencing the alarm. A brief description of each function follows along with a step by step guide to accessing each function.

- 1) **Self-Test.** In order to perform a self-test the UPS must be operating in the normal mode (see "UPS Display Status and Operating Condition", page 14). To initiate the self-test simply press and hold the Function Control button until the audible alarm sounds. The self-test also performs the same battery check described above.
- 2) **Alarm Silence.** The alarm silence feature is used to stop the audible alarm from sounding. Any time the audible alarm is sounding pressing the Function Control button will silence the alarm.
- 3) **Programming Mode.** There are three programming options: load shed, output enable/disable after input overvoltage backup, and reset battery installed date. In order to enter the programming mode the UPS must first be operating in Bypass mode without faults (see "Stopping the UPS: Option 1", page 13). Then press and hold the Function Control button. ("Press and hold" always means to hold until the unit gives audible feedback). The unit will give an audible feedback indicating the

unit is in programming mode. (If at anytime while the UPS is in the programming mode there is one minute of inactivity the UPS will automatically exit the programming mode and return to bypass operation.) What follows is a step by step guide to navigating in the programming mode, followed by a detailed description of each option.



- A. Load Shed. The backup LED will light indicating the UPS is now ready to make changes to the load-shed settings (see “The Load Shed Function”, page 16 for an explanation of load shedding). To accept this option press and hold the Function control button.
- A.1 The UPS comes from the factory set so the load shed receptacles function for the full battery backup time. The LEDs on the right side of the display will light to indicate the current setting for the load-shed level. For example, since the default factory setting is for no load shed, the first time the option is accessed no LEDs will be lit. Pressing the button once will cause the 20% LED to light. This would indicate that the load shed receptacles should be turned off when there is 20% battery power remaining. Pressing the

Function Control button successive times will increase the load shed level in 20% increments.

A.2 Once the option is set to the desired level, press and hold the Function Control button. This will save the new load shed level setting. The UPS will indicate that the value has been stored by blinking the LEDs. After blinking the LED for a short time the UPS will exit the programming mode and return to bypass operation. To return the system to normal operation switch the RUN/STOP switch back to the RUN position.

B. Output Enable/Disable After Input Overvoltage Backup. Press the function control button. The unit is now ready to change the output enable/disable after input overvoltage backup option. This is indicated by the 150% LED turning on. This setting determines whether the UPS will go to bypass in the case of an input overvoltage fault. To change this setting press and hold the function control button.

B.1 This setting is set to disable output at the factory. Pressing the function control button causes the 100% LED to light, indicating output has been enabled. Pressing it again will change it back to disabled and the 100% LED will go off.

B.2 Once the option is set as desired, press and hold the function control button to save the setting. The UPS will indicate the setting has been saved by blinking the LED(s). The LED(s) will continue to blink for a short time after which the UPS will exit programming mode and return to bypass operation. To return the system to normal operation switch the RUN/STOP switch back to the RUN position.

C. Reset Battery Installed Date. This should be done whenever a new battery pack is installed. Press the function control button. The unit is now ready to reset the battery installed date. This is indicated by the Battery LED turning on. Once this mode has been entered press and hold the function control button to reset the battery install date to the current date. The UPS will indicate that the date has been reset by blinking the Battery LED for a short time after which the UPS will return to bypass operation. To return the system to normal operation switch the RUN/STOP switch back to the RUN position.

Fixed Frequency Mode

The 1700 Series UPS has the option of operating in a fixed frequency mode. Normally the UPS operates in the frequency auto-detect mode. If a specific output frequency is required (i.e. 50Hz or 60Hz) the UPS can be set at the factory to supply the desired frequency regardless of the input frequency (input frequency must be within allowable limits, see Specifications on page 31). For a unit already in use the output frequency can be set through software. For instructions on setting the output frequency through software please contact Toshiba at (800) 231-1412 or by e-mail at toshibaups@tic.toshiba.com. **It is important to note that when the UPS is operating with a fixed output frequency, output is disabled in bypass.**

Adding an Additional Battery Module

Note: Only one additional battery module may be added to the standard unit. For longer runtime options contact your Toshiba sales representative or the Toshiba marketing department at (800) 231-1412 or by e-mail at toshibaups@tic.toshiba.com. Figure 5 shows the standard unit with one additional battery module added. To install a second battery module follow these steps:

- 1) Unplug the standard battery module from the electronics module. Unlock and remove the electronics module from the battery module.
- 2) Lock the two battery modules together. Plug the bottom battery module into the top battery module.
- 3) Lock the electronics module on to the top battery module. Plug the battery module into the electronics module.

It is not necessary to stack the modules for the system to operate. Refer to the section entitled "UPS Connections: Standard Module Connections" on page 10 for an explanation of how to lock and unlock the modules.

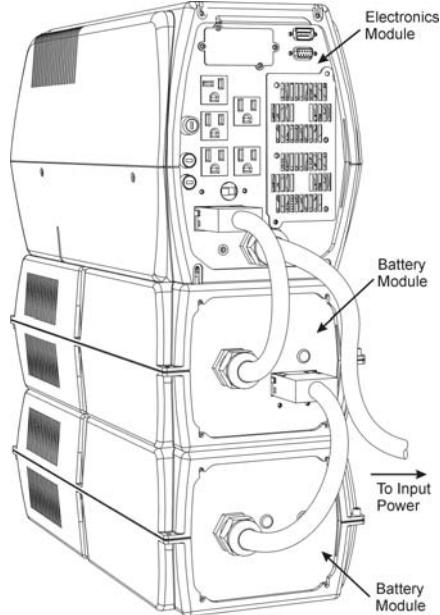


Figure 5
Expansion Battery Module

Other Option Modules

There are a number of other optional modules that can be ordered for the 1700 Series UPS system. Table 3 shows some of the available option modules. For information about options not listed here contact Toshiba's UPS Marketing Department at (800) 231-1412 or by e-mail at toshibaups@tic.toshiba.com.

Table 3
Option Modules

Part No.	Description	Input Voltage	Output Voltage
UF1-IO-0XX-6BG	Dual Transformer Module	208/240V	240/120V
UF1-IO-0XX-6AA	Single Isolation Transformer Module	120V	120V
UF1-IO-0XX-6EE	Dual Transformer Module	230V	230V
UF1-IO-0XX-XEE	Dual Transformer Module with Input Isolation	230V	230V
UF1-IO-0XX-EXE	Dual Transformer Module with Output Isolation	230V	230V

The XX in the part number is replaced by the kVA rating of the system (i.e. 2.4kVA = 024)

Figure 6 shows the standard 1700 series UPS with an optional input isolation transformer module (UF1-IO-024-6AA). Installation of the input transformer requires

the input power cord from the electronics module to be plugged into the transformer module. The transformer power cord is plugged into the power source. This is an example of how the option modules work. An instruction sheet is included with each module that shows how to connect that particular module.

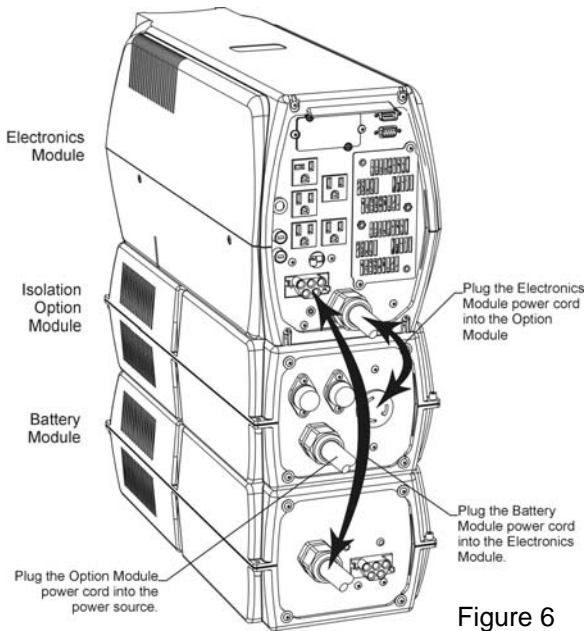


Figure 6

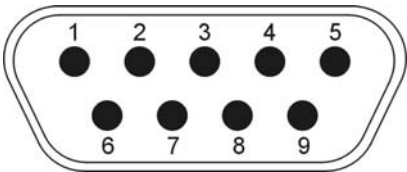
Isolation Transformer Module

Communication Interface

Dry Contacts

The remote contacts interface is a standard feature. It is provided through solid state relays with contacts through a DB9 male connector located on the back of the UPS (refer to the Communication Option User Manual for a more detailed description of this option). The following chart shows the signals and the connector pinout.

Pin	Signal Function	Logic	In the UPS	
1	Fault Signal	Closed when fault detected	<p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p>	
2	UPS stop common	Backup stop when the level changes from Low (-3 to -15V) to High (+3 - +15V)		
3	UPS stop signal input			
4	Normal input power supply	Closed with normal supply power		
5	Signal common	Common signal return		
6	Bypass operation	Closed during bypass operation		
7	Battery voltage low	Closed at voltage drop		
8	UPS operation	Closed during inverter operation		
9	Power failure signal	Closed at power failure		



DB9 Male Connector Outline
(facing connector)

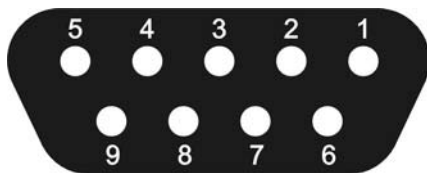
Voltage	Current
48Vdc peak	100mAdc peak
30Vac rms (42Vac peak)	70mAac rms (100mAac peak)

RS-232C

RS-232C serial communication interface is a standard feature provided through a DB9 female connector located on the backside of the UPS (see “Electronics Module Layout “, page 9). This interface allows communication between the UPS and a personal computer. The chart on the following page shows the signals and the connector pinout.

Pin	Signal Name	Description	In the UPS
1	-		N/C —○ 1
2	RXD	Receive data	RXD —○ 2
3	TXD	Transmit data	TXD —○ 3
4	DTR	Data terminal ready	○ 4* └───┐ GND —○ 5
5	GND	Signal ground	
6	DSR	Data set ready	○ 6*
7	RTS	Request to send	○ 7** └───┐ ○ 8**
8	CTS	Clear to send	
9	-		N/C —○ 9

(*) (**) These pins are tied together internal to the UPS. Signals DTR, DSR, RTS, and CTS are not used.



DB9 Female Connector Outline
(facing connector)

Special notes concerning RS-232C communication

- For Toshiba UPS protocol and command structure refer to the Communication Option User Manual
- The optional RemotEye™ SNMP interface is the recommended method for communication with the UPS system.
- If an optional RemotEye™ SNMP interface card is installed in the UPS only one method (SNMP or RS-232C) will function at a time.
- For a description of the cable required to connect to a Toshiba UPS system refer to the Communication Option User Manual or contact Toshiba's UPS Marketing Department at (800) 231-1412 or by e-mail at toshibaups@tic.toshiba.com.

Option Card Slot

The option card slot is a standard feature. An optional network adapter card slides into the slot which is located on the back of the electronics module (figure 1, page 9). This optional interface allows the UPS to be monitored across the network or from any point on the Internet (refer to the Communication Option User Manual for a more detailed explanation of this option).

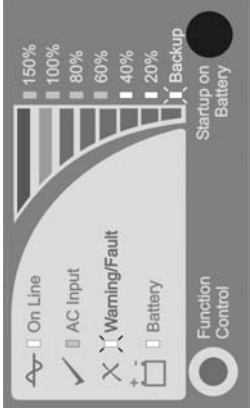
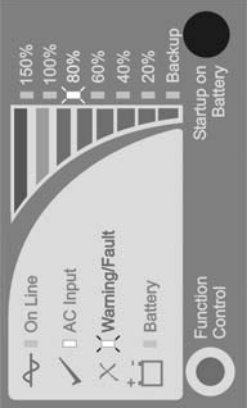
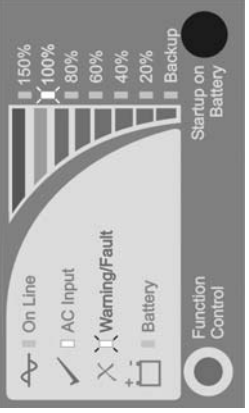
Troubleshooting

Warnings and Faults are those abnormal conditions that can occur and could cause the unit to stop normal operation. These conditions are detected by the protective circuitry in the unit. The UPS "Warning/Fault" lamp will light **red** when a warning or fault occurs. "Troubleshooting" involves monitoring the LED's on the front panel and then interpreting the readout by using the warning and fault mode display charts that follow. Only the state of the LED's listed in the chart should be considered. Other LED's might be active; nevertheless, only those listed under the column "LED state" should be considered when diagnosing a warning, or fault.

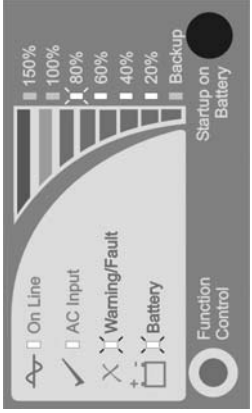
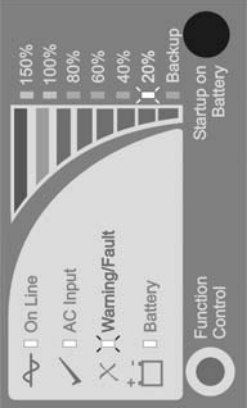
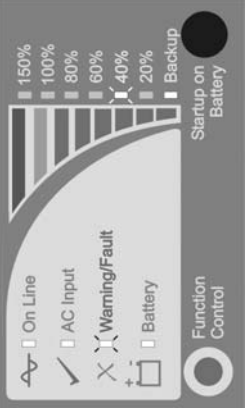
Warning/Fault Modes

All warnings will cause the red "Warning/Fault" LED to flash. All faults will cause the red "Warning/Fault" LED to light continuously. Some warnings and most faults will cause the UPS to transfer to bypass mode. In many cases, after the condition that caused the fault is corrected the unit will automatically transfer back to normal mode. For those cases where the unit does not transfer back automatically contact your Toshiba UPS service representative at 1-877-867-8773 (outside the U.S. call 713-466-0277).

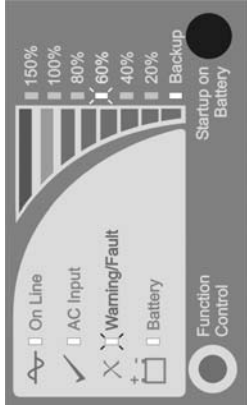
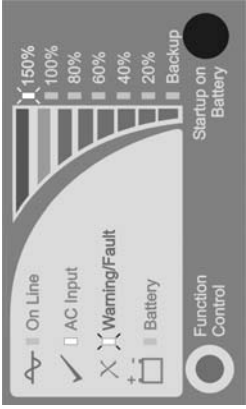
Warnings

Warning	Display State	LED State	Alarm State	Description and Resolution
Low Battery		Warning/Fault... Flash Backup Flash	Alarm will sound for 1-second at 5-second intervals.	The batteries have less than 30% power remaining. The warning will continue until either the batteries become completely exhausted or AC input power is restored.
Current Limit (Over Current)		Warning/Fault... Flash 80% Flash	Alarm will sound for 1/2-second at 1-second intervals.	An output current limit warning is typically a sign of misapplication. The load may not be appropriate for UPS support. For further explanation contact your Toshiba UPS service representative at 1-877-867-8773 (outside the U.S. call 713-466-0277).
Ambient Over Heat		Warning/Fault... Flash 100% Flash	Alarm will sound for 1-second at 15-second intervals.	The temperature of the UPS operating environment is too high. Causes of this condition include allowing the room temperature to exceed 104°F (40°C), a blocked vent or direct sunlight on the unit. The unit will transfer to bypass until the temperature is reduced.

Warning (cont'd)

Warning	Display State	LED State	Alarm State	Description and Resolution
Battery Over Heat		Warning/Fault... Flash Battery Flash	Alarm will sound for 1-second at 15-second intervals.	This warning can be caused by the same conditions listed for ambient overheat. Another possible cause would be a problem with the battery module, which could prevent the unit from providing backup power.
Input Under Voltage (see note 1)		Warning/Fault... Flash 20% Flash	Alarm will sound for 1/2-second at 10-second intervals.	This warning will occur if the input voltage drops below the minimum allowable voltage. If the unit was online when the warning occurred it will transfer to battery backup. After the backup the output will shutdown. If the unit was in bypass the output will be turned off. The unit will reinitialize the startup sequence if input power returns to within specified limits.
Input Over Voltage (see note 1)		Warning/Fault... Flash 40% Flash	Alarm will sound for 2, 1/2-second beeps at 10-second intervals.	This warning will occur if the input voltage exceeds the maximum allowable voltage. If the unit was online when the warning occurred it will transfer to battery backup (see note 2). If the unit was in bypass the output will be turned off. The unit will return to normal operation if input power returns to within specified limits.

Warnings (cont'd)

Warning	Display State	LED State	Alarm State	Description and Resolution
Input Frequency Regulation (see note 1)		Warning/Fault... Flash 60% Flash	Alarm will sound for 3, 1/2-second beeps at 10-second intervals.	The input frequency is outside specified limits. If the unit was online when the warning occurred it will transfer to battery backup. After the backup the output will shutdown. If the unit was in bypass the output will be turned off. The unit will return to normal operation if input frequency returns to within specified limits.
Output Overload		Warning/Fault... Flash 150% Flash	Alarm will sound for 1-second at 15-second intervals.	The connected load exceeds the UPS power rating. Reduce the load attached to the UPS. The unit will automatically return to normal operation.



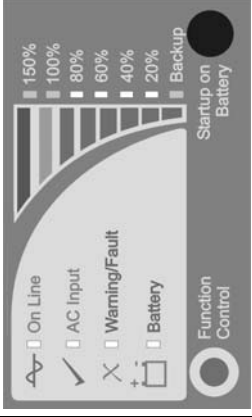
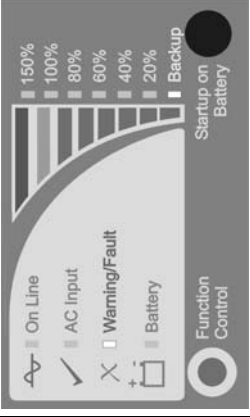
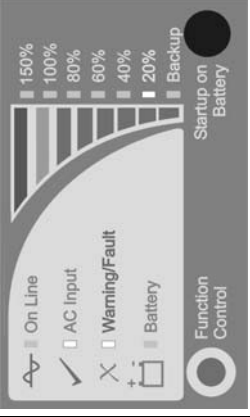
= Flashing LED

= LED lit continuously

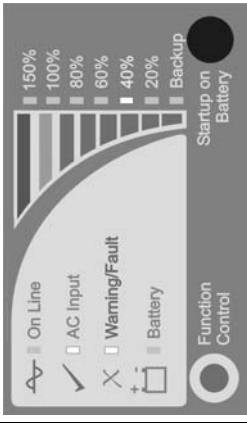
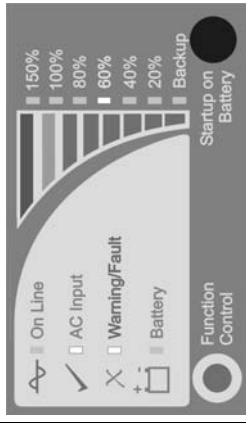
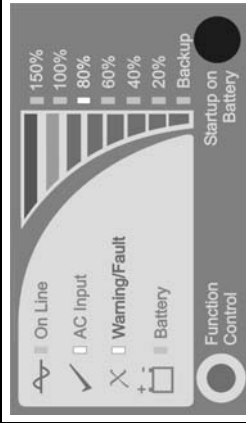
Note 1: If any of these faults occur while the UPS is in online mode it will immediately transfer to backup mode. In this case the percentage LED's will be used to show the battery power status. To identify the fault that has occurred listen to the number of consecutive beeps. One beep indicates an input undervoltage, two beeps means input overvoltage, three beeps is a frequency problem.

Note 2: Once the batteries are exhausted the unit will either shutdown the output, or switch to bypass according the selections set by the user (see the section entitled "Programming Mode" part B on page 19).

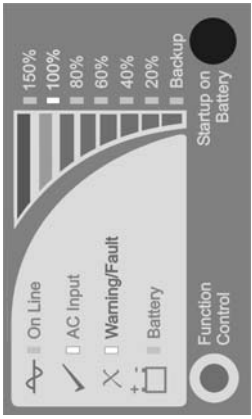
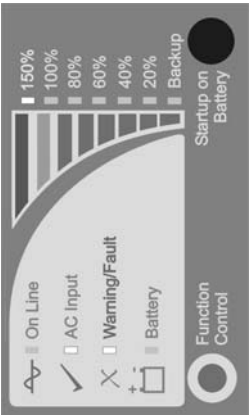
Faults



Fault	Display State	LED	Alarm State	Description and Resolution
Replace Battery		Warning/Fault... On Battery On	Alarm will sound for 1/2-second, at 1/2-second intervals.	Battery pack is not connected or needs replacement as soon as possible. After replacing the batteries the battery timer must be reset (see "The Function Control Button", page 17). Failure to replace the battery pack could result in danger to the user and failure of the system to provide backup power.
Battery Shutdown		Warning/Fault... On Backup On	Continuous alarm	The battery power of the unit has been exhausted. The unit output will shutdown. Batteries must charge before backup power will be available. For charging times see page 16.
DC Bus Over Current		Warning/Fault... On 20% On	Alarm will sound for 1/2-second, at 1/2-second intervals.	This fault indicates an internal problem with the UPS. Contact your Toshiba UPS service representative at 1-877-867-8773 (outside the U.S. call 713-466-0277).

Faults

Fault	Display State	LED State	Alarm State	Description and Resolution
DC Bus Over Voltage		Warning/Fault... On 40% On		
DC Bus Voltage Imbalance		Warning/Fault... On 60% On	Alarm will sound for 1/2-second, at 1/2-second intervals.	These faults indicate an internal problem with the UPS. Contact your Toshiba UPS service representative at 1-877-867-8773 (outside the U.S. call 713-466-0277).
Output Under Voltage		Warning/Fault... On 80% On		

Faults

Fault	Display State	LED State	Alarm State	Description and Resolution
Output Over Voltage		Warning/Fault... On 100% On	Alarm will sound for 1 1/2-second, at 1 1/2-second intervals.	These faults indicate an internal problem with the UPS. Contact your Toshiba UPS service representative at 1-877-867-8773 (outside the U.S. call 713-466-0277).
System Over Heat		Warning/Fault... On 150% On		

 = Flashing LED  = LED lit continuously

Storage of UPS Equipment.

General Guidelines

If the UPS equipment is to be stored; the following guidelines should be used.

Avoid:

- 1) Storage in sites subject to extreme changes in temperature or high humidity.
- 2) Storage in sites subject to exposure of high levels of dust or metal particles
- 3) Storage on inclined floor surfaces or in sites subject to excessive vibration.

Before Storing:

- 1) Allow UPS to be operated for 4 hrs to ensure that the batteries are fully charged.
- 2) Stop the unit (see "Stopping the UPS" on page 13).
- 3) Place the unit's Input Breaker switch in the "off" position (see "Electronics Module Layout", page 9).

Storing:

- 1) Store within a temperature range of -20° to 40° C (-4° to 104° F). If the UPS is stored at a temperature outside of the allowable operating range, allow time for the unit to reach equilibrium with the ambient temperature before starting the UPS.
- 2) For best results, store the UPS in the original shipping container and place on a wood or metal pallet.
- 3) The optimum storage temperature is 21° C (70° F). Higher ambient temperatures cause UPS batteries to need recharging more frequently.

Recharging requirements during storage:

Recharging the batteries requires that the battery module be connected to the UPS and the UPS must have AC input power available. The UPS can be in either the on line or bypass mode. (See "Starting the UPS", page 12, and "Battery Recharge Time", page 16).

- 1) If stored in an ambient temperature less than 20°C (68°F), recharge the batteries every 9 months.
- 2) If stored in an ambient temperature of 20° to 30°C (68° to 86°F), recharge the batteries every 6 months.
- 3) If stored in an ambient temperature of 30° to 40° C (86° to 104°F), recharge the batteries every 3 months.

Disposal

Please contact your local environmental agency for details on disposal of electrical components and packaging in your particular area. ***It is illegal to dump lead-acid batteries in landfills or dispose of improperly.*** Please help our Earth by contacting the environmental protection agencies in your area, the battery manufacturer, or call Toshiba toll-free at (800) 231-1412 for more information about recycling.

Preventive and Scheduled Maintenance/Parts Replacement

Preventive Maintenance

Toshiba's 1700 Series of UPS systems have been designed to provide years of trouble-free operation requiring a minimum of preventive maintenance.

The best preventive measure is to keep the area around the unit, particularly the air inlet vents, clean and free of moisture and dust accumulations. If the atmosphere of the installation site is very dusty, use a vacuum cleaner to periodically remove dust accumulations from the exterior of the unit, especially around ventilation openings. Schedule authorized Toshiba service centers to perform internal parts inspections annually, or call a Toshiba UPS service representative at 1-877-867-8773 (outside the U.S. call 713-466-0277).



CAUTION

Proper maintenance of the battery system of this unit is essential to the safety and reliability of the UPS system.

Parts Replacement

The following list shows intervals for periodic maintenance and replacement of certain UPS parts.

- 1) Battery Module: Replacement should be done once every 3 to 5 years at a minimum.
- 2) Output Fuses: Replace once every 7 years (always replace fuses with same fuse type and rating).
- 3) Cooling fan: Replace once every 3 years. (Fan replacement must be done by Toshiba authorized service personnel.)

Appendix A: Specifications

Model Number		UF1A1A015C6(T)	UF1A1A020C6	UF1A1A024C6
Capacity		1500VA (1.05KW)	2000VA (1.40KW)	2400VA (1.68KW)
Input	Input voltage ¹	Single phase 120VAC, +20% to -50%		
	Input frequency	30 to 70 Hz		
	Input capacity	1500VA	2000VA	2400VA
	Input power factor	Approximately unity (0.95 to 1.0)		
Bypass	Input voltage ²	Single phase 120VAC, $\pm 10\%$		
	Output voltage	Single phase 120VAC		
	Overload rating	See appendix C		
Output	Output voltage	Single phase 120VAC		
	Output voltage regulation	Within $\pm 3\%$, steady state		
	Output frequency	50/60 Hz ($\pm 0.5\%$ in free running mode, line sync range $\pm 1\text{Hz}$)		
	Rated load power factor	0.7		
	Rated output current (rms)	12.5A	16.7A	20A
	Inverter overload capacity	125% for one minute; 150% for 30 seconds		
	Crest factor	2.5 at full load		
Battery	Type	12V, flame retardant, valve regulated lead acid		
	Battery backup time (fully charged, 0.7 power factor, 25°C (77°F))	17 minutes (at full load)	13 minutes (at full load)	9 minutes (at full load)
	Configuration	2 strings in parallel, 4 batteries per string		
Environment	Operating temperature	0° to 40°C (32° to 104°F)		
	Altitude	Up to 1000m (3000 ft) above sea level		
	Efficiency	86%		
	Operating Humidity	30 to 90%, non-condensing		

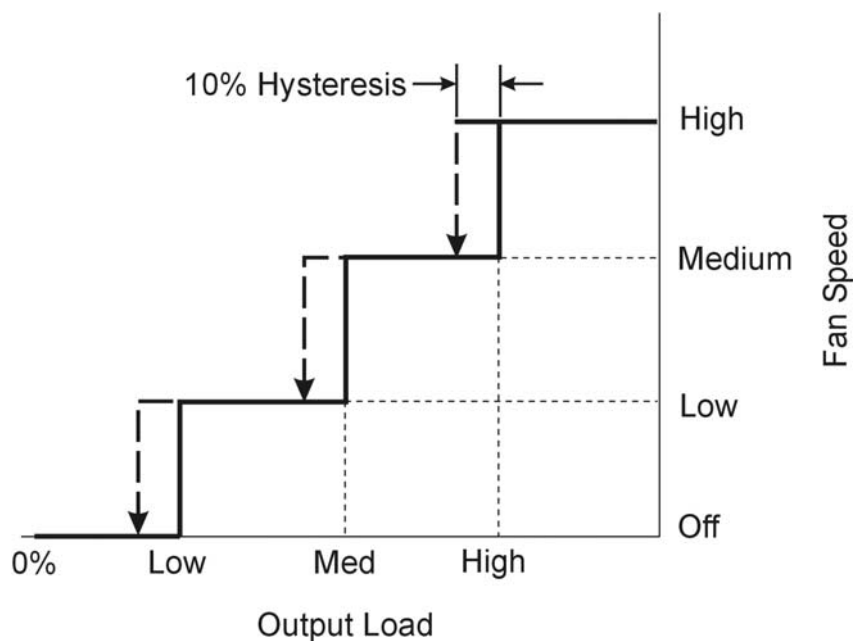
Note1: Below 77% input voltage unit may begin parallel operation; supplementing input power with battery power. The point at which parallel operation begins is load dependant (for a detailed explanation of Parallel Operation see appendix D).

Note2: Input voltage range is limited in bypass for load protection. (For a detailed explanation of Bypass Undervoltage / Overvoltage see appendix E.)

Appendix B: Fan Speed Control

The fans in the 1700 Series will operate at any of four different speeds depending on the environment and system conditions. In the first stage the fans are off. As the load and or the temperature increase the fans will subsequently go to low, medium or high speed as required.

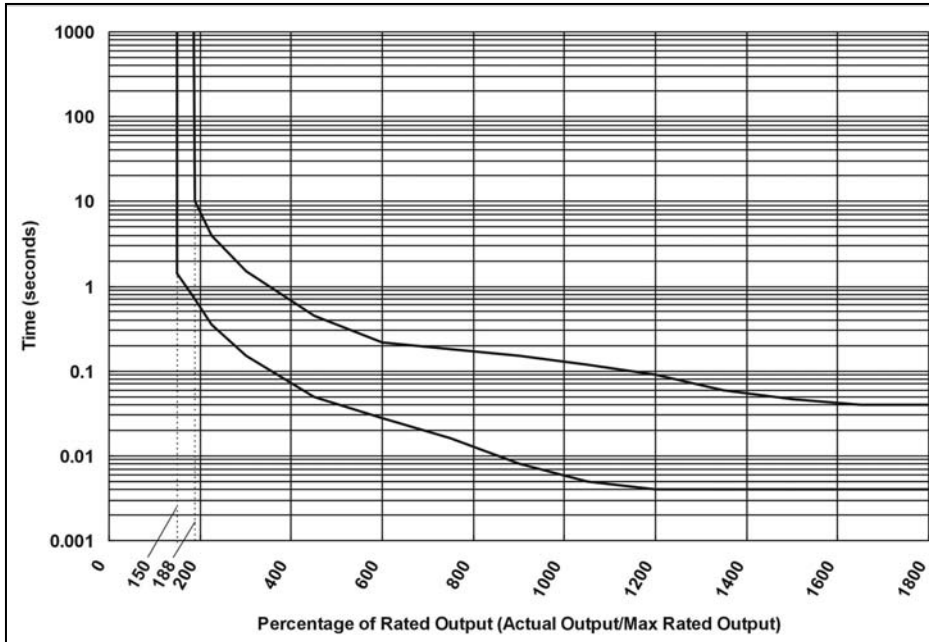
Fan Speed vs. Load (at 25°C)



The temperature reference given on the graph above refers to the temperature inside the UPS. There will typically be a 5°C difference between the internal and external temperature. The 10% hysteresis shown is to ensure that the unit will not oscillate between fan speeds. When the output power reaches a level that requires the fan speed to increase the load will have to be reduced 10% below that level before the fan speed will return to the lower speed.

Appendix C: System Overload Rating

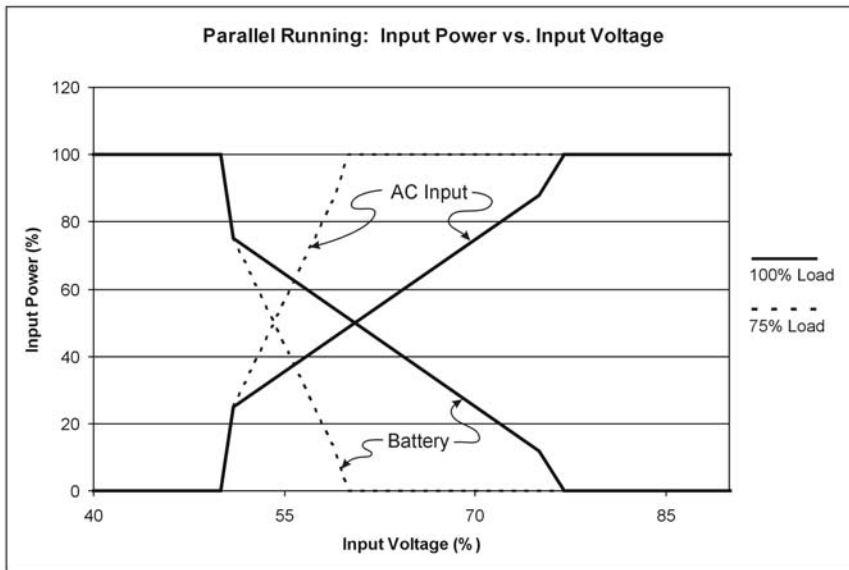
The 1700 Series UPS is capable of supporting short duration overloads. When operating in the On Line mode output overloading of 125% of the rated output current can be supported for 1 minute, and 150% for 30 seconds. If the overload continues the unit will switch to bypass mode. When in bypass mode the 1700 Series overload capacity is limited by the input breaker. The following graph shows the response of the breaker depending on the applied load. The two lines shown on the graph represent the upper and lower limits of the breaker response. The response of a particular breaker could fall anywhere between these two lines.



If the load capacity of the breaker is exceeded the breaker will trip, shutting down both the UPS and the attached loads. If the breaker's capacity is not exceeded the unit will continue to operate in the bypass mode until the applied load is reduced. When the load on the UPS is reduced to within the specified limits the UPS will automatically return to On Line mode.

Appendix D: Parallel Operation

The 1700 Series UPS offers a standard feature that allows the unit to operate with very low input voltage without de-rating the output power. If the input voltage drops below a certain point the unit will switch to parallel mode. Parallel mode means that the unit is using the available input voltage and supplementing with battery power. Because battery power is being used, the time the unit can operate in parallel mode is limited. However, the time will be longer than that available when the unit is operating on battery power alone. The point when the UPS will enter parallel mode will vary depending on the output load. The following graph shows the various stages based on full output load and 75% output load.



As shown by the graph the lower the output load the lower the input voltage can go before parallel mode is activated. However, the minimum input voltage will always remain at 50% (60VAC for a 120VAC system).

Appendix E: Bypass Undervoltage / Overvoltage

When the 1700 Series UPS is in bypass mode the undervoltage and overvoltage limits are restricted to $\pm 10\%$ of the rated input voltage. If the input voltage is outside of this voltage window the UPS output will be turned off. There is a 5% hysteresis associated with both the upper and lower limits. This means that once output has been turned off the input voltage will have to be within $\pm 5\%$ of the rated input voltage before the startup sequence will reinitialize. (To start the UPS when the input power is outside of the allowable range see the section entitled "Starting on DC Power", page 13.)

When the UPS is started, if the RUN/STOP switch is in the STOP (bypass) position the unit will start in the on-line mode for 1 second before switching to bypass mode. If the input voltage is out of range the UPS will turn off the output after 1 second rather than switching to bypass.

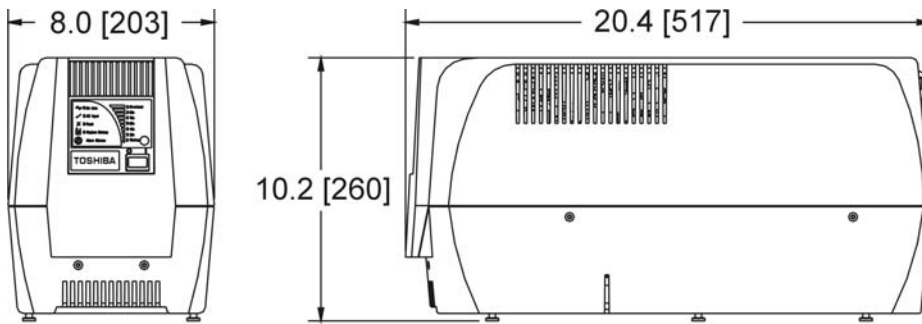
Appendix F: Unit Configuration Options

The following chart shows the configuration options for each base model UPS.

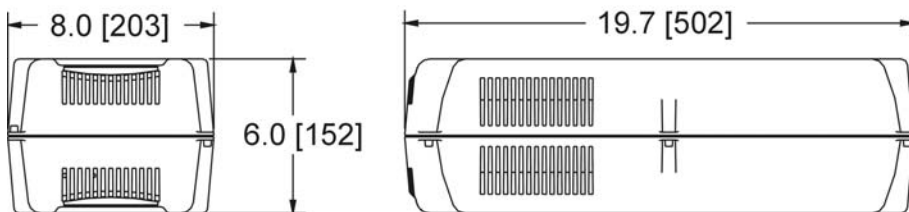
Model Number	Description	Available Option Modules	Description
UF1A1A015C6	1500VA Electronics Module	UF1-BC-087	48V battery module
		UF1-IO-015-6BG	208/240V input; 240V/120V output transformer module
		UF1-IO-015-6AA	120V input isolation transformer module
		UF1-IO-015-6EE	230V input; 230V output transformer module
		UF1-IO-015-XEE	230V input isolation, 230V output transformer module
UF1A1A015C6T	1500VA Electronics Module with internal isolation transformer	UF1-BC-087	48V battery module
		UF1-IO-015-6BG	208/240V input; 240V/120V output transformer module
		UF1-IO-015-6EE	230V input; 230V output transformer module
UF1A1A020C6	2000VA Electronics Module	UF1-BC-087	48V battery module
		UF1-IO-020-6BG	208/240V input; 240V/120V output transformer module
		UF1-IO-020-6AA	120V input isolation transformer module
		UF1-IO-020-6EE	230V input; 230V output transformer module
UF1A1A024C6	2400VA Electronics Module	UF1-BC-087	48V battery module
		UF1-IO-024-6BG	208/240V input; 240V/120V output transformer module
		UF1-IO-024-6AA	120V input isolation transformer module
		UF1-IO-024-6EE	230V input; 230V output transformer module

Appendix G: Weights and Dimensions

Module Model No.	Module Weight		Shipping Weight	
	Pounds	Kilograms	Pounds	Kilograms
UF1A1A015C6	26	12	31	14
UF1A1A015C6T	46	21	51	23
UF1A1A020C6	30	14	35	16
UF1A1A024C6	30	14	35	16
UF1-BC-087	51	23	56	25



Electronics Module
Dimensions are in inches [mm]



Battery/Option Module
Dimensions are in inches [mm]

TOSHIBA INTERNATIONAL CORPORATION LIMITED WARRANTY POLICY
(48 contiguous U.S. States, Canada, Mexico)
(UNINTERRUPTIBLE POWER SUPPLIES-UPS)

TOSHIBA INTERNATIONAL CORPORATION ("TIC") warrants that the 1700 Series Uninterruptible Power Supplies ("UPS") and Uninterruptible Power Supply Battery ("BATTERY") (external battery cabinet) sold by TIC to the end user ("User") shall be free of defects in material and workmanship.

Series	Capacity	UPS Unit		Battery		Toshiba Dispatch
		Warranty ¹	On-Site ²	Warranty ¹	On-Site ²	
1700	1.5, 2.0, 2.4 kVA	36 months	No, Depot	24 months	No, Depot	M-F, 8 ^{am} -5 ^{pm} CT
Note 1: The warranty period begins from the shipment date. The shipment date is determined by the date on the TIC Bill of Lading.						
Note 2: For the 1700 Series the warranty applies if the unit is sent and returned (paid for) by the user to/from the Toshiba plant or a Toshiba designated Authorized Service Center.						

If any UPS, part of UPS, and/or BATTERY fails to conform or is defective then TIC will repair or replace it at TIC's option.

LIMITATIONS AND EXCLUSIONS

This limited warranty shall not cover the UPS, UPS part, or BATTERY during their respective warranty periods, if the following storage, maintenance, installation, operating conditions are not met throughout the warranty periods (5 conditions below):

VALVE REGULATED LEAD ACID (VRLA) BATTERIES FOR TOSHIBA UPS REQUIRED OPERATING CONDITIONS		
1. Temperature	Annual Average Temperature 25°C (77°F)	Temperature per cell < 32°C (89°F) for more than 30 days
2. Maximum number of full charge/discharge cycles	Discharge time	Maximum Number of Cycles (24 months)
	30 minutes	69
	15 minutes	86
	10 minutes	110
	5 minutes	130
VALVE REGULATED LEAD ACID (VRLA) BATTERIES FOT TOSHIBA UPS INSTALLATION AND MAINTENANCE CONDITIONS		
3. Storage	While UPS is in transit or storage it must always be in suitable temperature (see condition 1).	
4. External Batteries	Parallel battery string applications must be approved by TIC in writing.	
5. Idle Batteries	User must recharge the batteries if not in use (charged) for more than 6 months.	

1. This Warranty does not cover damage or defect caused by misuse, improper application, wrong or inadequate electrical current/voltage/frequency, inadequate connections, inadequate water or drain services, user negligence, repair by non-Toshiba designated personnel, accident during shipment, tampering, alterations, a change in UPS and/or BATTERY location or application, exposure to the elements, acts of God, theft, sabotage, installation contrary to TIC's recommendations or specifications (Published Operation Manuals), also if serial numbers have been altered, defaced, or removed.
2. Repair or replacement of a defective UPS, UPS part, and/or BATTERY does not extend the respective original warranty period. All defective UPS, UPS parts, and/or BATTERIES shall be the property of TIC upon replacement.
3. This warranty shall constitute the sole and exclusive remedy of all purchasers and users of the UPS, UPS part, and/or BATTERY. TIC's responsibility for UPS, UPS Parts, and/or BATTERY shall not exceed one times the net UPS and/or BATTERY purchase price. **TIC HEREBY EXPRESSLY DISCLAIMS ALL OTHER EXPRESS, STATUTORY AND IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

PROCEDURE

User must contact TIC via e-mail upsservice@tic.toshiba.com, or phone 1-877-867-8773 (outside the U.S. call 713-466-0277), no later than 90 days after User's discovery of occurrence or defect in UPS, UPS part, and/or BATTERY **but in no event after the expiration of the respective warranty period**. Subject to the limitations of this policy and product type, TIC service or TIC service representative shall repair/replace the UPS/part warranted hereunder, without charge for material, labor. If TIC determines that the requested repair is not covered under this limited warranty policy, then TIC shall **advise** customer and quote cost of repair. Repair charges shall be based on service parts price and prevailing service charges at the time of repair.

If the case in process is a BATTERY (stand-alone and/or cabinet) TIC will use its published Battery Diagnostic Document to evaluate warranty applicability. First, TIC will make sure that the storage, maintenance, installation, and operating conditions were met; then the BATTERY capacity will be tested in accordance with the "performance test" guidelines IEEE Std 450. If the BATTERY fails to deliver 70% of its rated capacity it shall be deemed defective and be replaced. Either float or cyclic service will be used to determine the warranty credit (as per published Battery Diagnostic Document). The typical credit applied will be as in the following table:

Credit for Replacement Battery When Approved Warranty		
Time from Shipment	UPS Batteries	Cost to Customer
(months)	% Credit	% List Price
0-24	100	0
25-30	55	45
31-36	45	55
37-42	35	65
43-48	25	75
49-54	15	85
55-60	5	95

MODIFICATIONS

No **representative**, salesperson, agent, distributor, **or** employee of TIC is authorized to modify any of the terms of this warranty, unless modifications are made in writing and signed by an authorized TIC officer.

THIS WARRANTY REPRESENTS THE ENTIRE AGREEMENT BETWEEN TIC AND USER WITH RESPECT TO THE SUBJECT MATTER HEREIN AND SUPERSEDES ALL PRIOR OR CONTEMPORANEOUS ORAL OR WRITTEN COMMUNICATIONS, REPRESENTATIONS, UNDERSTANDINGS OR AGREEMENTS RELATING TO THIS SUBJECT

Notes:

Notes:

TOSHIBA

TOSHIBA INTERNATIONAL CORPORATION

INDUSTRIAL DIVISION

13131 West Little York Rd., Houston Texas 77041

Tel: (800) 231-1412 Fax: (713) 466-8773